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FINAL REPORT DATA MANAGEMENT STUDY APPENDIX M

CONTRACTOR DATA REQUIREMENTS SAFETY (SA)

PREPARED BY:

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Manager, Quality Assurance
Voyager Spacecraft System Project

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PROJECT ENGINEER, DATA MANAGEMENT
VOYAGER SPACECRAFT SYSTEM PROJECT

APPROVED BY:

A. FRANK, COGNIZANT ENGINEER

DATA MANAGEMENT AND CONTROL TASK

VOYAGER SPACECRAFT SYSTEM PROJECT

Prepared for
National Aeronautics and Space Administration
NASA Pasadena Office
Pasadena, California

UNDER NASA CONTRACT No. NAS7-584



P.O. Box 8555 • Philadelphia, Penna. 19101

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INTRODUCTION

1.1 DEFINITION - SAFETY (SA)

These data describe the procedures, controls, methods, studies, and reporting needed to ensure the safety of Voyager operations.

1.2 SCOPE

The System Safety Engineering Plan describes the actions and activities required to ensure maximum protection of personnel, facilities and equipment associated with all phases of the Voyager Project from design to flight of the spacecraft.

The safety operation through the application of management and engineering resources will emphasize awareness and resolution of potential safety problems associated with the development, evaluation and reporting of safety.

| DATA ITEM NUMBER | DATA ITEM SAFETY | DESCRIPTION |
|------------------------|---|--|
| SA- 001 | Plan, System Safety Engineering | Describes System Safety Engineering criteri in applicable disciplines and the approach/m during design, development, manufacturing |
| SA- 002 | Manual, Safety | Implement general Departmental policies and cedures for handling hazardous materials; as equipment and facilities. |
| SA- 003 | Report, Safety Training Program | Provides Safety Training for specific hazard Voyager Project. |
| SA- 004 | Report, Systems Interfaces, Hazards and Analysis | Analysis of system and subsystems to determ modes and subsystem interfaces to determin of the total system. |
| SA- 005 | Report, Safety Recommendations | Reports safety recommendations made by the records the action taken. |
| SA- 006 | Report, Accident/Incident | Used to assure that accidents or incidents whave a potential to do so, are thoroughly investigated in the control of the contr |
| SA- 007 | Minutes, Integrated Safety Board Meetings | Minutes of formal meetings of the Integrated |
| SA- 008 | Report, Safety | Provides a summary of components analyzed acceptability, summarizes test plans review safety requirements reviewed and approved documents the results of safety audits perfor with requirements set forth in the Safety Mar |
| SA- 009 | Directive, Safety | Communicates urgent safety requirements to Compliance is mandatory. |
| SA- 010 | Report, Personnel Certification Program | Reports individuals by name who are certific i.e., propellant handling, system test, etc. |
| SA- 011 | Report, Ordnance Accountability | Reports quantity and type of pyrotechnics in expended items. |
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^{*} KEY INFORMAL DATA

DATA ITEM LIST/USER MATRIX

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USER FLOW DIAGRAMS

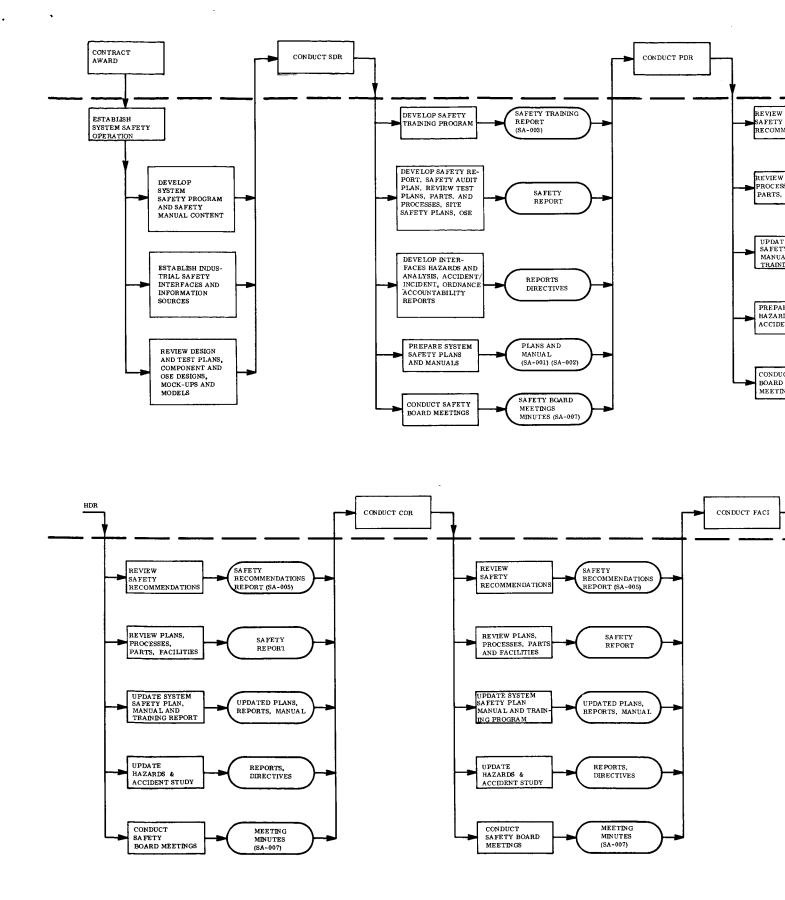
Contractor - user flow diagrams (show the relationship between Voyager system documentation and the activities undertaken by the prime spacecraft contractor. The diagrams are intended to be a communication tool which describes the project in terms which emphasize documentation and as a planning tool for the integration of data management activities into the overall project management scheme.

The project is considered in a generalized sense in that subsystems and components are each treated as collective entities; that is, the documentation flows associated with the several separate subsystems are not distinguished. A single representative flow is presented.

The drawings show the detail activities and are keyed to the formal design and hardware reviews. A generalized summary flow is also included.

Safety User Flow Diagrams

| Figure Number | Title |
|---------------|---|
| M-1 | Safety User Flow Diagram - Summary |
| M-2 | Safety User Flow Diagram - Contract Award Through Critical Design Review |
| M-3 | Safety User Flow Diagram - Critical Design Review Through Launch |



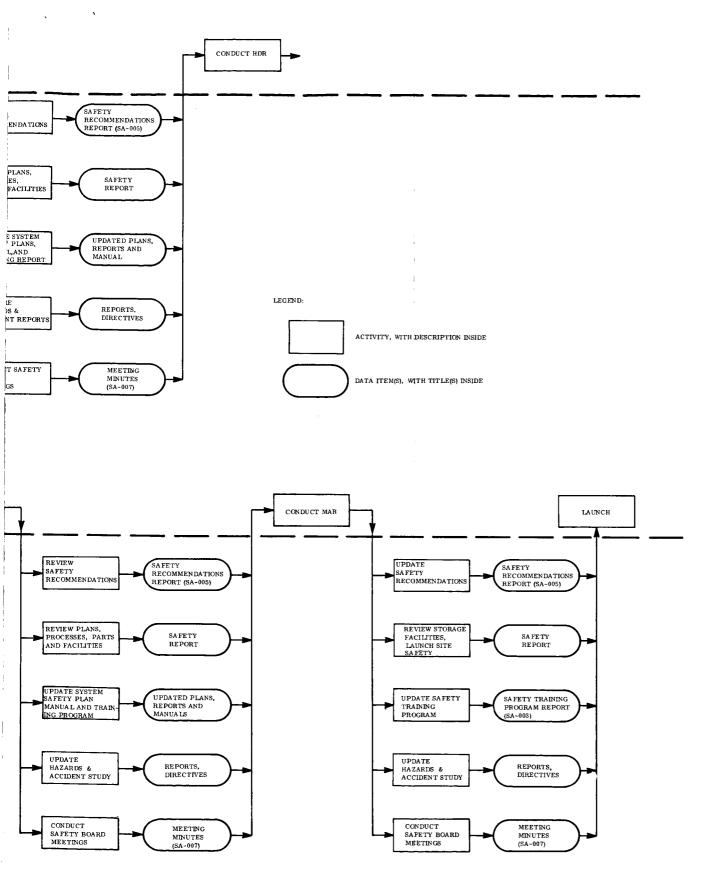
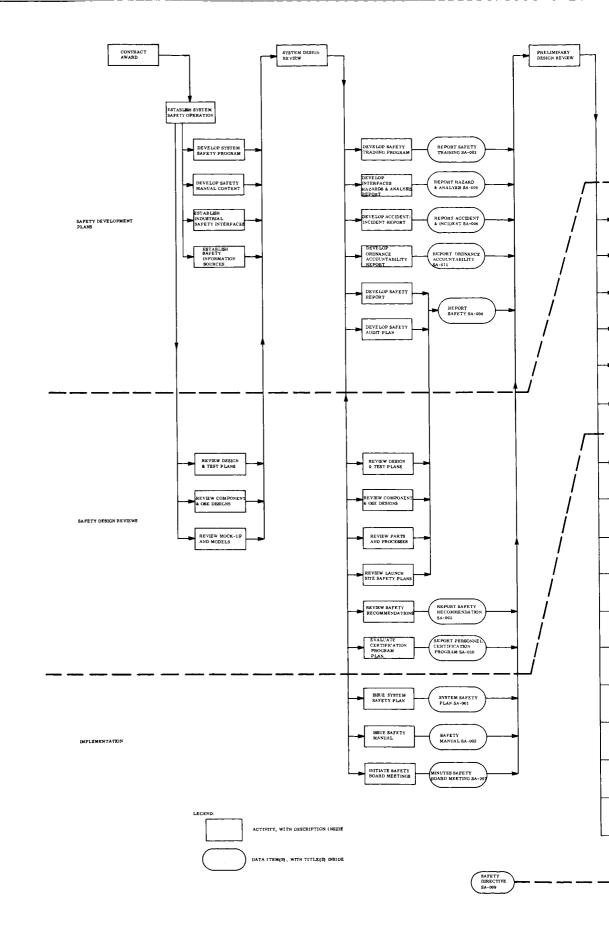


Figure M-1. Safety User Flow Diagram - Summary



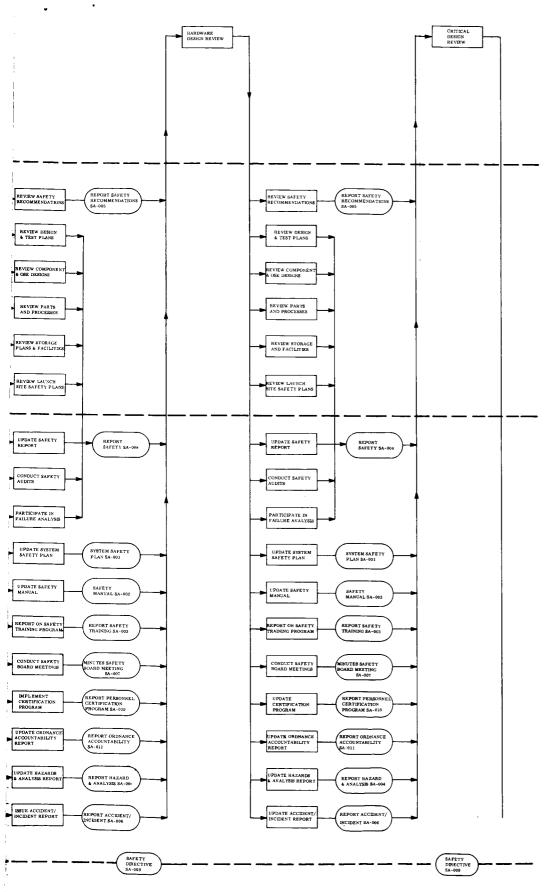
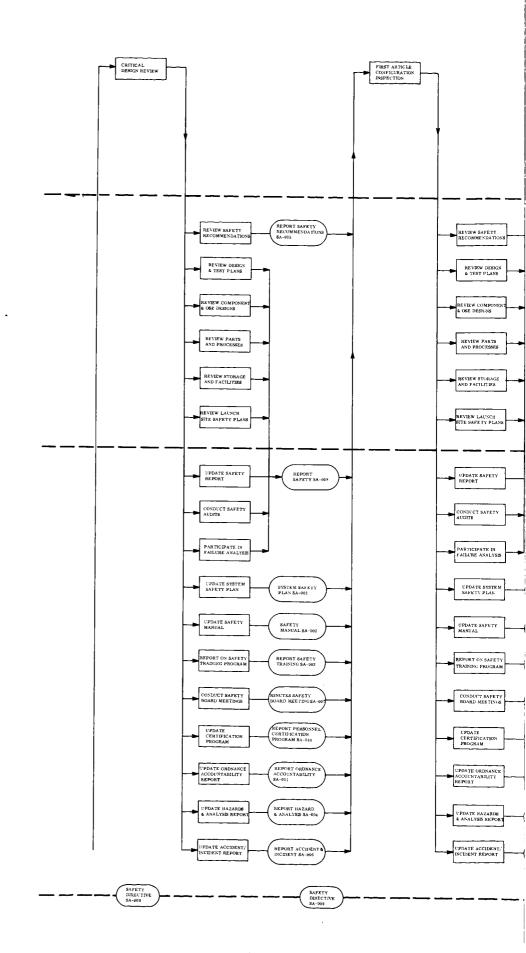


Figure M-2. Safety User Flow Diagram-Contract Award Through Critical Design Review



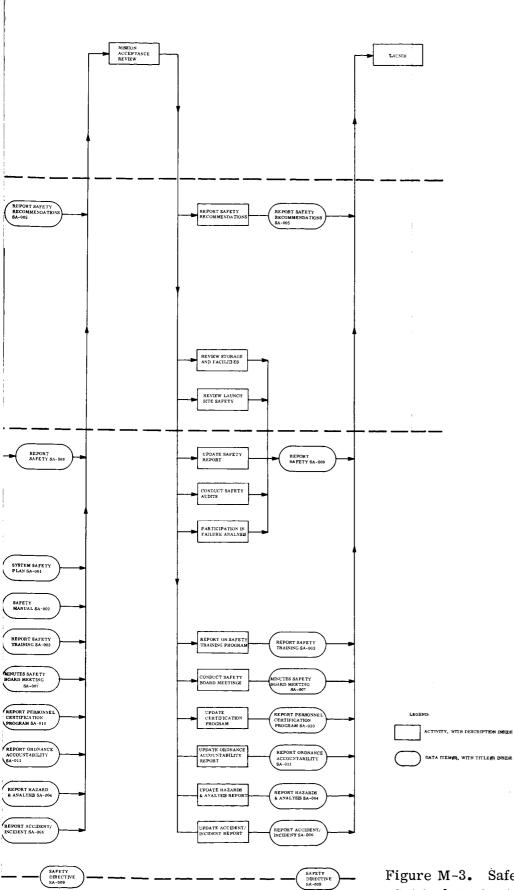


Figure M-3. Safety User Flow Diagram-Critical Design Review Through Launch

Safety Data Requirement Descriptions

| DRD Number | Title |
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| SA-001 | Plan, System Safety Engineering |
| SA-002 | Manual, Safety |
| SA-003 | Report, Safety Training Program |
| SA-004 | Report, Systems Interfaces, Hazards and Analysis |
| SA-005 | Report, Safety Recommendations |
| SA-006 | Report, Accident/Incident |
| SA-007 | Minutes, Integrated Safety Board Meetings |
| SA-008 | Report, Safety |
| SA-009 | Directive, Safety |
| SA-010 | Report, Personnel Certification Program |
| SA-011 | Report, Ordnance Accountability |

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SA-001

The System Safety Engineering Plan is the vehicle for defining the overall safety plan for controlling safety on the Voyager Project. This plan will be information and definition of intent for NASA, direction for operations, and a general guide document for subcontractors and launch test centers compliance.

SPECIAL DISTRIBUTION: (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW)

OUTLINE OF CONTENTS:

The System Safety Engineering Plan presents the overall system safety plan and identifies the planned state-of-the-art engineering techniques to be implemented on the Voyager Project, to meet the safety requirements related to personnel, flight hardware, and test equipment.

Authorities and responsibilities will be documented, and enforcement plans will be presented. The safety plan objectives to be implemented during the design, development, manufacturing and testing phases of the program will be described.

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| Safety Manual will be descriptive and detailed in content. | |
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| OUTLINE OF CONTENTS: | |
| The Safety Manual will describe all safety related subjects, policies, instructions, and directives, define responsibilities and authorities, and also explain safety operating procedures. It will list hazardous materials, and operations related to the Voyager vehicle, with special emphasis on those hazards that cannot be minimized under present day knowledge. | |
| The Safety Manual will be required reading for all supervising personnel and completion of this reading will be documented by signed statement. | |
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| ☐ RECORDING (TA | PE OR DISC) | ☐ ENGINEERING CHANGE | | | APPLICABLE STAN | DARDS: | | - |
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| VOYAGER DATA REQUIREMENT DESCRIPTION - 2ND SHEET | |
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| SPECIAL INSTRUCTIONS: | DRD NO.: SA-003 |
| Management and supervision should use this report to maintain an awareness of required Safety Training Programs. | |
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| SPECIAL DISTRIBUTION: (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW) | |
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| OUTLINE OF CONTENTS: | |
| Describes Safety Training Program, and plans. Subject matter will be general safety as well as specific Voyager-related safety. | |
| This report will also report on the number of personnel and safety programs that they are certified in, i.e., propellant handling, explosive handling, systems testing, etc. | |
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JPL 2568 OCT 65

| VOYAGER DATA REQUIREMENT DESCRIPTION - 2ND SHEET | |
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| SPECIAL INSTRUCTIONS: SA-00 | |
| This report should be considered as required reading for all management and supervisory personnel on the Voyager Project. | |
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| SPECIAL DISTRIBUTION: (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW) | |
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| OUTLINE OF CONTENTS: | |
| Describes subsystems, systems analysis performed to identify hazards and failure modes; it will also identify interface hazards which require subcontractor awareness, or those hazards identified by subcontractors for our attention. | |
| This report will be a compilation of all the known hazards resulting from design interface and/or testing in critical areas. This report will be used to report these conditions in a summary format for ready reference through all management responsible areas. | |
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| ORGANIZATION ORIGINATING REQUIREMENT: | SA | OFFICE RESPONSIBLE F | OR DRD. | CODE. | | A. Boppel | 7/28/67 | NO. | SA-005 | |
| TITLE OF DOCUMENT: | • | | | • | | organization r for document i Safety | | TASK OR SUBTASK: | DRL ITEM NO.: | |
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| GE EXHIBIT DRD 5A-003 | |
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| VOYAGER DATA REQUIREMENT DESCRIPTION - 2ND SHEET | |
| SPECIAL INSTRUCTIONS: | DRD NO.: SA-005 |
| Voyager supervisor will review and comment on recommendations made by the customer. | |
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| SPECIAL DISTRIBUTION: (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW) | |
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| OUTLINE OF CONTENTS: | |
| Report, Safety Recommendation | |
| 1. Introduction and scope 2. Summary of recommendations | |
| 3. Responsible operations review list 4. Action due dates assignments 5. Summary of company answer | |
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| VOYAGER DATA REQUIREMENT DESCRIPTION | | | | | | DRD APPROVED BY | ·: | DATE | DATA CATEGORY: | |
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| VOYAGER DATA REQUIREMENT DESCRIPTION - 2ND SHEET |] |
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| SPECIAL INSTRUCTIONS: | DRD NO.: SA-006 |
| Monthly issuance will be maintained even if no accidents or incidents have occurred. | |
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| OUTLINE OF CONTENTS: | |
| Used to assure communications of accidents or incidents which degrade the system, or have a potential to do so, and to report on results of related investigations. | |
| This report will be maintained throughout the life of the Voyager Project and will be issued to launch site personnel identifying the accidents and/or incidents noted at the launch site. | |
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| VOYAGER DATA REQUIREMENT DESCRIPTION - 2ND SHEET | |
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| Minutes, Integrated Safety Board | |
| 1. Title of Board | |
| 2. Date of meeting3. Names of personnel attending | |
| 4. Purpose of board meeting5. Subject matter discussed | |
| 6. Findings and resolutions | |
| 7. Follow up or subsequent actions necessary8. Distribution | |
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| VOYAGER DATA REQUIREMENT DESCRIPTION - 2ND SHEET | |
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| SPECIAL INSTRUCTIONS: SA-00 | |
| This report will be broken down into sections, design phase, test plans, range safety, and periodic audits. This report should be considered by Voyager management as required reading item. | |
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| 3. Summary matrix, approved naroware 3. Summary matrix, test plans reviewed | |
| 4. Summary OSE reviewed for safety | |
| 5. Audit reports 6. Follow-up action identification | |
| 7. Range safety | |
| a. Voyager required by prime contractor b. Launch center requirements | |

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| SPECIAL INSTRUCTIONS: |
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| Safety directives are the responsibility of management, and as such are mandatory reading. |
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| OUTLINE OF CONTENTS: |
| The Safety directive will be a document requiring mandatory compliance by all operations concerned. It will be issued by the Safety Operation, Voyager. This directive has the authority to stop work. |
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| VOYAGER DATA REQUIREMENT DESCRIPTION - 2ND SHEET | |
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DOCUMENTATION RELATIONSHIP TREES

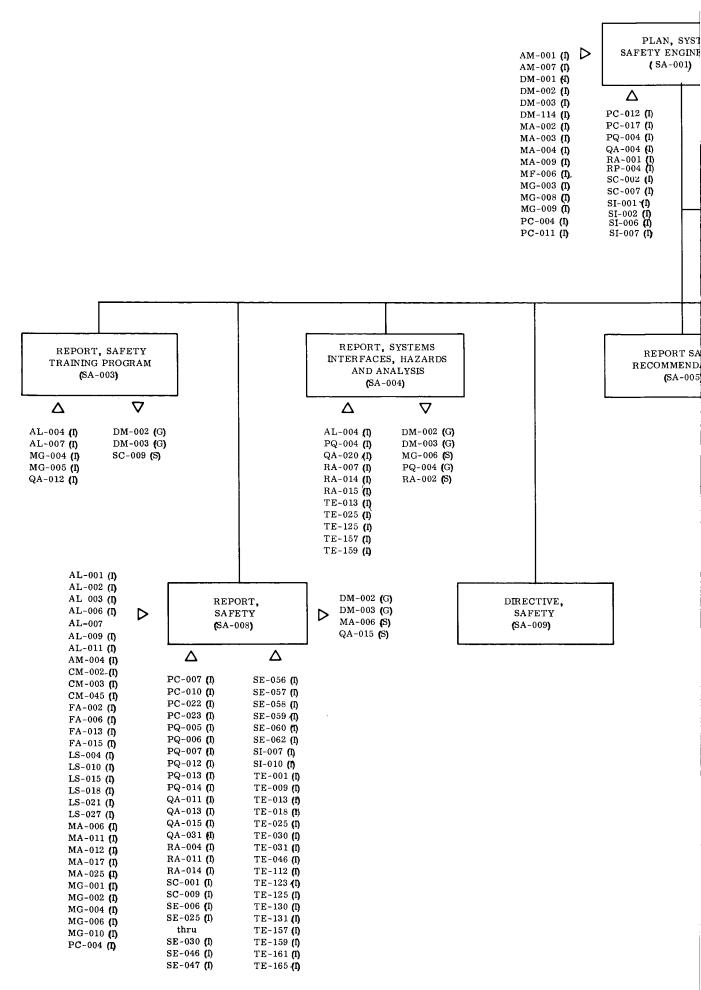
A documentation relationship tree has been prepared to further develop the data base interrelationships by identifying and presenting pictorially the relationships of all Voyager contractor data items within each functional category and by showing their relationships across categories.

Relationships within the functional category are shown by constructing a tier pattern beginning with the top level (or governing) data item and relating, in descending order, all data items within the category to this top level data item. (The location of a data item at a given level on the diagram does not necessarily indicate the importance of that specific item but identifies and defines its relation to all other data items in that category.)

Relationships between data items in one category and data items in other functional categories are shown by: (1) arrows to indicate the direction of the relationship, and (2) an alphabetic code to indicate the nature of the interrelationship as follows:

- a. Data items needed for preparation and/or support of the referenced item. (1)
- b. Data items supported or needed by this data item. (S)
- c. Data items that relate "to" and provide information of a general nature but are not required in an input or support role. (G)

Each data item appearing on the Data Item List (DIL) was examined and evaluated with respect to its contribution to, or dependence on, data items appearing in other categories, and is included in the diagrams.



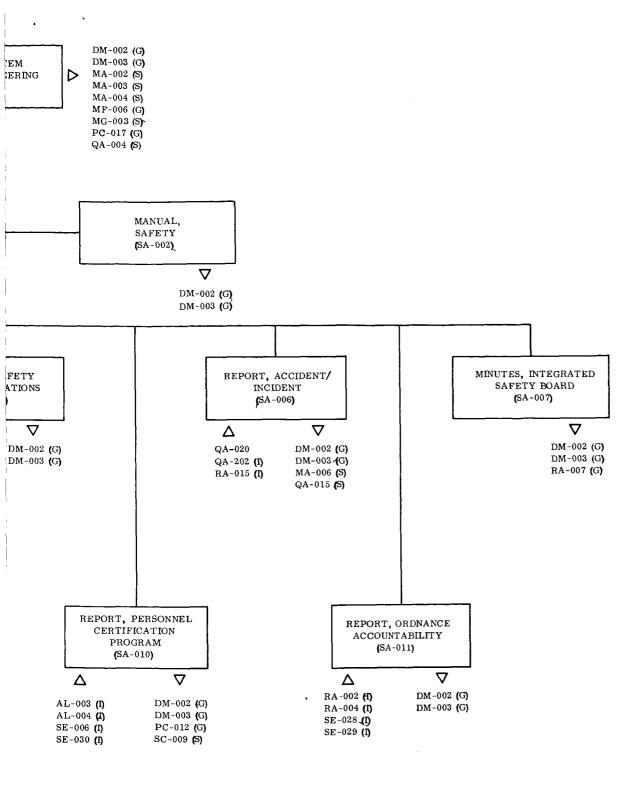


Figure M-4. Safety Documentation Relationship Tree (SA)

DATA ITEM PHASING, FREQUENCY

The Data Item Frequency and Phasing chart shows the requirements for contractor data item preparation by major project review periods. It is concerned with the phasing and frequency of preparation of each individual data item and not the total number of copies required for reproduction and distribution.

The following legend and/or abbreviations have been used:

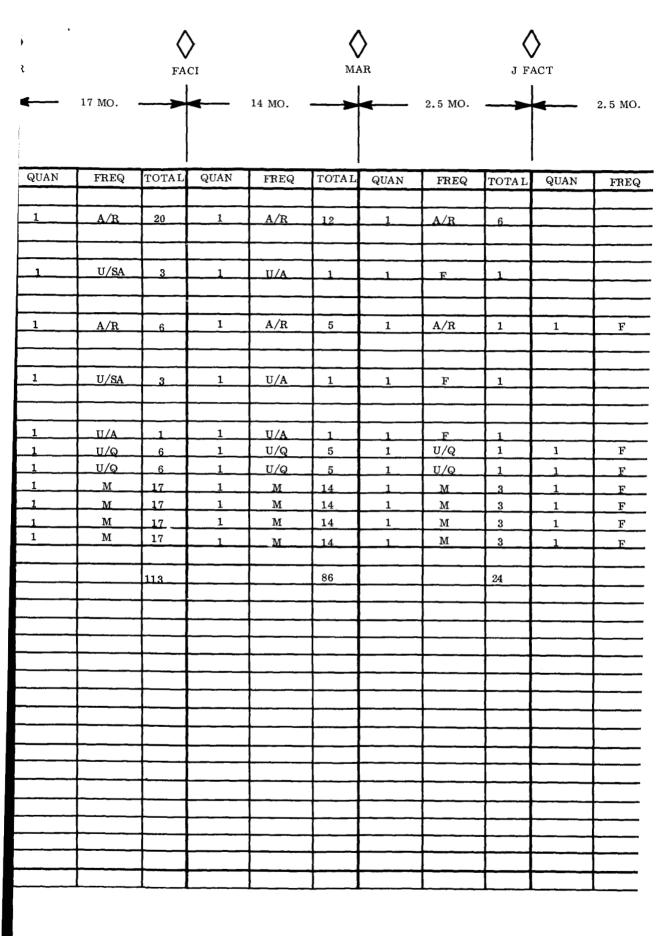
| A | Annual |
|--------|---|
| S/A | Semi Annual |
| WK | Weekly |
| MO | Monthly |
| B/W | Biweekly |
| B/M | Bimonthly |
| O/T | One time |
| A/R | As required |
| U | Update |
| I/U | One update |
| DA | Daily |
| Q | Quarterly |
| I | Initial |
| F | Final |
| N/R | New and revised |
| SDR | System design review |
| PDR | Preliminary design review |
| HDR | Hard design review |
| CDR | Critical design review |
| FACI | First article configuration inspection |
| MAR | Mission acceptance review |
| J FACT | Joint flight acceptance composite testing |
| | |

DATA ITEM TITLE

SAFETY

| | | QUAN |
|-------------|---|------|
| DIRECTIVE | S | |
| SA-009 | Directive, Safety | |
| | | |
| MANUALS | | |
| SA-002 | Manual, Safety | |
| MINUTES | | |
| | Market Telephone Add Co. D. 135 etter | |
| SA-007 | Minutes, Integrated Safety Board Meetings | |
| PLANS | | |
| SA-001 | Plan. System Safety Engineering | |
| | | |
| REPORTS | | |
| SA-003 | Report, Safety Training Program | |
| SA-004 | Report, Systems Interfaces, Hazards, and Analysis | |
| SA-005 | Report, Safety Recommendations | |
| SA-006 | Report, Accident/Incident | |
| SA-008 | Report, Safety | |
| SA-010 | Report, Personnel Certification Program | |
| SA-011 | Report, Ordnance Accountability | |
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| | SE SE |) DR | | PI |) DR | | ALC HI |) OR | | CD |
|--------|-------|-------------|---------|-------|-------------|---------------|-------------|-------------|---------------|----------|
| 3.5 MO | | — | 3.5 MO. | | - | 9 MO. | | ◀ | 12 MO. | |
| FREQ | TOTAL | QUAN | FREQ | TOTAL | QUAN | FREQ | TOTAL | QUAN | FREQ | TOTAL |
| | | 1 | I | 1 | 1 | A/R | 12 | 1 | A/R | 12 |
| | | 1 | I | 1 | 1 | Ŭ/Q | 3 | 1 | U/SA | 2 |
| | | 1 | I | 1 | 1. | A/R | 3 | 1 | A/R | 4 |
| | | 1 | I | 1 | 1 | U/Q | 3 | 1 | U/SA | 2 |
| | | 1 | I I | 1 | 1 1 | U/Q U/Q | 3 | 11 | U/SA U/Q | 2 4 |
| | | 1 1 1 | I I | 1 1 1 | 1 1 1 | U/Q M M | 3 9 9 | 1 1 1 | U/Q M M | 12 12 |
| | | 1 | I | 1 | 1 | M M | 9 | 1 | M M | 12 |
| | | | | | 11 | | 66 | | | 78 |
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Figure M-5. Safety Data Item
Phasing and Frequency Matrix